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HANDEDNESS AND EYEDNESS OF CHILDREN REFERRED TO A GUIDANCE CLINIC

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HANDEDNESS AND EYEDNESS OF CHILDREN REFERRED TO A GUIDANCE CLINIC*

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The apparent frequency with which left-handed individuals and those of other sinistral types are encountered among children and adults showing problems in mental adjustment has led to considerable speculation as to a possible relationship between types of laterality and personality constitution. Attempts to reduce this relationship to definite terms, however, have generally led to conflicting and uncertain findings. The responsibility for this situation rests largely on the fact that both handedness and personality are factors difficult to define and measure, and the fact that there is little agreement among investigators as to the terms to be used. Comparison among reported studies is thus rendered particularly difficult. In making such comparisons, at the present time, the only course open to the individual investigator is to state clearly his own criteria, and to qualify, in terms of these, any conclusions he may wish to draw as to the bearing of his results upon other published findings.

Of investigations which seem to show a positive relationship between laterality and personality traits, those of Quinan (1, 2) are the most striking. Using a system of classification based upon hand and eye preference, Quinan has compared various occupational groups, patients with mental disorders, violators of certain motor vehicle laws, and similar special categories, with groups taken to represent the general population. The relatively high proportion of sinistrals, especially of the crossed hand-eye types, found in certain of these groups leads him to suggest that sinistrals, as compared with dextrals, are more delicately constituted, and that their perceptive faculties are perhaps more sensitive and impressionable. In particular, he reports finding the highest proportion of sinistrality among patients in a psychopathic hospital who have received a diagnosis of constitutional psychopathic inferiority.

* Recommended for publication by Dr. C. M. Louttit, May 10, 1939.

In an effort to determine whether or not any such situation existed with respect to children showing problems which led to their being referred to a child guidance clinic, routine observations as to laterality of function were made by the writer on all cooperative cases seen by him during an entire clinic year, from September through June. An entire year was selected for study in order to offset possible seasonal variations in types of problems referred.

Subjects

The children seen by the writer included all cases above the age of 4½ years who were referred to the Yale Clinic of Child Development during the year because of any problem whatever. There is no particular selection of problems made in accepting cases referred, and the result is a fairly representative sampling of personality and adjustment difficulties, problems of school achievement, general conduct problems, parent guidance problems, and the like.

None of the children seen could be classified as actually psychotic. A good many showed traits which, if found in older persons, would suggest a diagnosis of psychopathic personality. The significance of this fact is not, of course, to be pressed too far, since a number of the criteria for such a diagnosis in adults involve behavior which is normal for young children.

In addition to the cases referred because of individual problems, a large group of cases was seen in which the primary reason for referring was a routine examination required before a dependent child is committed to the care of the State. Since, in such cases, the child is not referred because of any special problems he has shown, but on the basis of a social situation, such as the loss of his parents, or their inability to care for him, data for this group were compiled separately as a control measure. As will be seen (Table II, *infra*) they conformed quite closely to findings previously reported for population samplings. This group, hereafter referred to as the Commitment Group, comprised 73 cases.

The group to be referred to as the Problem Group was obtained by taking only those cases referred because of a definite problem presented by the child. From this list were eliminated *a*) those cases in which the I. Q. fell below 65 (a purely arbitrary figure),

on the ground that the mental deficiency indicated by a lower psychometric rating would provide in itself sufficient basis to account for the problems; *b*) cases showing a specific physical factor which might be instrumental in causing the problem, such as birth injury, epilepsy, chorea, etc., as well as those with defective vision or hearing; *c*) cases being followed up from previous years because of specific reading disability or defective speech, since there is some ground for believing that these problems are particularly associated with sinistrality and partial sinistrality, and since the writer's personal interest in these problems at that time caused them probably to be over-represented among the "old" cases. In addition, a few cases were eliminated in which the only question raised was as to whether or not the child was ready for first grade entrance, or something similar, involving no special behavior problem. In 8 or 10 cases data were not obtained because of lack of time, or, in the case of some very young children, because of lack of satisfactory cooperation in the tests of ocular dominance.

There remained in the problem group 160 cases, ranging in age from 4 years 7 months to 15 years 8 months. All were of I. Q. 65 or higher, with more than 65% falling within the "average" intelligence range, I. Q. 90 to 110. The median age was 9 years, while the middle 50% of cases fell between 7 and 11½ years.

Tests of Handedness and Eyedness

For the purpose of the present report—to determine simply whether or not there exists any marked relationship between laterality type and a tendency to develop behavior or adjustment problems—handedness has been determined upon the basis of the hand used for writing or drawing and for throwing a large and a small ball.[1]

Throwing was tested by placing a small soft rubber ball (diameter 2½ inches) on a low table in front of the child, in the midline, with his hands at his sides. He was instructed at the count of

[1] In a large number of cases, where time and the child's cooperation permitted, a series of other observations on laterality was made. It is planned to analyze this material for further, and possibly more detailed, evidence as to the apparent association between laterality types and problems of adjustment.

three to throw the ball as hard as he could against a cloth screen which faced him from the opposite wall of the room. Three trials were taken, but in no case was there any change in the preferred hand. The same instruction was given on a single test with a larger ball, 7 inches in diameter, except that he was told to use both hands in throwing it. In this case, the hand recorded was the one drawn back to give propulsive force in throwing. In all cases this was the same hand that was preferred for unimanual throwing.

If the right hand was consistently used for *both* throwing and writing, the child has been classified, for present purposes, as right-handed. If the left hand was used for *either* or *both* activities, he has been considered as left-handed. While there were several cases in which the right hand was used for writing and the left for throwing, the reverse of this was found in only two cases. Thus in practically all instances, handedness has been determined by throwing, as in Quinan's investigations.

This criterion does not, of course, catch all cases which might, under one definition or another, be classified as left-handed. Some of the children who are right-handed in throwing and writing will show sinistral tendencies in other activities. Neither has any account been taken of cases in which forced changes in handedness have brought the child to prefer the right hand for both writing and throwing, although there undoubtedly are a few such cases. Parents' reports on this matter are often difficult to interpret. Where the change is reported to have been made in infancy, the reference is often to a case in which the development of consistent unilateral preference has come a little later than usual, and would have come in any case, regardless of efforts to train the right hand. Some parents, too, will deny a history of left-handedness, or of attempts to force a change, even when these have been present. Again, memory may be faulty. The principal reason, however, for omitting consideration of converted cases in the present study, is the fact that in many of the cases, particularly in the Commitment Group, past history is fragmentary or even lacking altogether.

While these considerations have an effect upon the distribution of sinistrals and dextrals in these groups, the result will be to show a relatively higher number of dextrals than would be the case

if a broader definition of left-handedness had been used. This will, therefore, add to the significance of any particularly high proportion of sinistrals that may be found.

Eyedness was determined by the use of the Miles A-B-C Vision Test, or V-Scope (3). This is essentially a truncated cardboard cone, 9½ inches long, with both the large and the small ends open. The cone is constructed of two pieces of cardboard, and lies flat until it is opened by the subject's pressing inward with both hands. The subject holds the cone in this way, with both hands, the large end before his eyes, and looks through it at a series of cards bearing pictures or symbols, being instructed to report what he sees. Two V-Scopes are provided, and are interchanged between exposures. Ocular selection in this case is automatic and unconscious, the subject not even being aware that he is seeing the test-object with only one eye, or that eyedness is being tested at all. The eye used is readily noted by the examiner.

Ten trials were given every subject with the V-Scope. If one eye was preferred in as many as 8 of the 10 trials, this has been taken as the dominant eye. If the ratio of preference of one eye over the other was less than 8:2, the subject has been classified as having incomplete uniocular dominance, or as impartial-eyed.

This method of testing eyedness has certain advantages over that used by Quinan, which involved sighting with a wooden pistol held first in one hand and then in the other. The unconscious selection of the eye used, and the fact that both hands are used to hold the sighting object, are definite experimental advantages. The use of a larger number of trials is likewise important, since variations from the use of the normally preferred eye are especially likely to come on the first or second trial. Moreover, in sighting with a gun, previous experience and practice may affect the result.

Results

Quinan's categories of RR, RL, LL, and LR, have been used, with the addition of two types, RI and LI, to include the impartial-eyed cases. The first letter in each instance denotes the preferred hand, the second the preferred eye. RL, for example, means right-handed and left-eyed. Quinan also included a small miscellaneous group of ambilateral and other types, the characteristics of which

were not specifically defined. It has not been found necessary to use this category in the present study, as all cases reported fall under one or another of the types described.

TABLE I

DISTRIBUTION OF HAND-EYE TYPES IN PROBLEM GROUP AND COMMITMENT GROUP

	Dextral	Sinistral			Impartial-Eyed		
	RR	RL	LL	LR	LI	RI	Total
Problem Group							
Number of Cases:	62	59	13	10	5	11	160
	39%	37%	8%	6%	3%	7%	
Commitment Group							
Number of Cases:	49	20	2	1	0	1	73
	67%	27%	3%	1.5%	0	1.5%	

	Total Sinistrality	Total Sinistrality plus Impartial-Eyedness
Problem Group	54%	61%
Commitment Group	31.5%	33%

Table I shows the actual and percentage incidence of these various types in both groups of cases studied. The Problem Group is seen to be significantly more sinistral than the Commitment Group on every count. Two-thirds of the Commitment Group are complete dextrals, as to both hand and eye, while less than 40% of the Problem Group fall under this classification. Under each of the sinistral or partially sinistral categories, there is a far greater proportion of cases in the Problem Group than among the controls. Especially striking, since such data have not previously been reported, is the relatively large number of cases of incomplete ocular dominance among the problem cases, forming 10% of the total, as opposed to 1 case out of 74 in the Commitment Group.

When the figures for all the sinistral and partially sinistral types are combined and added to the number of impartial-eyed cases, the total is relatively almost twice as great—61% against 33%—for the problem over the non-problem group.

TABLE II
PERCENTAGE INCIDENCE OF HAND-EYE TYPES IN VARIOUS GROUPS

	Dextral	Sinistral			Impartial-Eyed		Total Sinistrality	Total Impartial-Eyedness
	RR %	RL %	LL %	LR %	LI %	RI %	%	%
Quinan (1):								
1,000 U. of Cal. Undergraduates	70.4	18.5	4.0	3.6			26.1	
317 Chinese School Children	69.7	20.8	4.7	2.2			27.7	
Updegraff (4):								
74 Nursery School Children	64.4	25.4	6.8	3.4			35.6	
Parson (5):								
877 Public School Children	68.9	25.7	3.6	.5	(1.4)		29.8	1.4
Selzer (6):								
539 Public School Children (Grades 2-6)	63.1	21.6	9.1	5.6	(.6)		36.3	.6
Miles (7)[1]:								
147 Miscellaneous Cases	59.	24.	7.	9.	1 case	1 case	40.	1.5
Castner (present study):								
73 Commitment Cases	67.	27.	3.	1.5	0.	1.5	31.5	1.5
160 Problem Cases	39.	37.	8.	6.	3.	7.	54.	10.
Quinan (1):								
70 Constitutional Psychopathic Patients (adults)	37.1	38.5	7.1	8.5			54.1	

[1] In calculating the percentages of the various types from Miles's data, I have omitted his group of senior medical students. This group shows a slightly different distribution from other groups, and it is just possible that habitual use of the microscope has affected ocular dominance, as he suggests, though this is at present entirely conjectural.

Since there are no generally accepted figures for the distribution of lateral types among the population as a whole, the results of several representative surveys have been brought together in Table II to form a basis for comparison with the results of the present study. Despite differences in technique and in criteria of handedness and eyedness, these different figures do not show so wide a variation as might have been expected. In general, they do not tend to differ greatly from the results obtained for the Commitment Group used as a control group in this report.

It is of interest to note that the distribution for our Problem Group is very nearly identical with that reported by Quinan for a group of constitutionally psychopathic adults. The significance of this fact must not be too hastily interpreted. However, it is quite possible that these two groups may be made up, in large part, of individuals of the same type of basic personality constitution. The diagnosis of "constitutional psychopathic personality" is, of course, a sort of psychiatric catch-all, used for cases without psychosis, but showing adjustment difficulties somewhat equivalent to the behavior problems for which these children are referred to a guidance clinic.

It is also to be noted in Table II that the incidence of impartial-

TABLE III

PROBLEM GROUP AND COMMITMENT GROUP COMPARED AS TO DOMINANT HAND AND EYE

	Right-Handed %	Left-Handed %	Right-Eyed %	Left-Eyed %	Impartial-Eyed %
Problem Group	83	17	45	45	10
Commitment Group	96	4	68.5	30	1.5

UNILATERALITY VS. BILATERALITY OF HAND AND EYE DOMINANCE

	Unilateral (RR+LL)	Bilateral (RL+LR)
Problem Group	47	43
Commitment Group	70	28.5

(This listing does not include the "impartial-eyed" group)

eyedness among the general population is uniformly reported as very low, as in our Commitment Group. Its occurrence, therefore, in 10% of our Problem cases must be taken as significant of its association with a tendency toward adjustment difficulties.

Handedness and eyedness are analyzed individually in Table III, in which the Problem Group is again shown to be more strongly sinistral on every item than the Commitment Group. This difference is considerably greater in the case of eyedness than of handedness.

The lower part of Table III brings out the difference between the two groups in the matter of unilateral hand and eye dominance. Cases in which the preferred eye is on the same side as the preferred hand constitute 70% of the Commitment Group, and only 47% of the Problem Group.

In making a distribution of the data by age levels, cases which were being followed up from previous years were omitted, since it was desired to have the information in terms of the age at which the child was first referred. In most instances the results obtained later would be identical with those obtained at the first visit, but there are some cases in which a change takes place as the child grows older, in the preferred hand, or, more frequently, the preferred

TABLE IV

TOTAL PROBLEM GROUP COMPARED WITH "NEW" CASES

		Dextral	Sinistral			Impartial-Eyed		Total Sinistrals	Total Sinistrals and Impartial-Eyed
	No. of Cases	RR %	RL %	LL %	LR %	LI %	RI %		
Total Group	160	39	37	8	6	3	7	54%	61%
New Cases	117	38	38	8	7	2	8	55%	63%

eye. As may be seen from Table IV, the figures for the "new" cases, seen for the first time during the year under consideration, are substantially identical with the findings for the group as a whole,

TABLE V

PERCENTAGE DISTRIBUTION OF HAND-EYE TYPES BY AGE GROUPS IN "NEW" CASES OF PROBLEM GROUP

Age in Years*	Number of Cases	Dextral	Sinistral			Impartial-Eyed		Total Sinistrals	Total Sinistrals plus Impartial-Eyed
		RR	RL	LL	LR	LI	RI		
		%	%	%	%	%	%	%	%
5 to 7	34	41	32	18	0	3	6	53	59
8 to 10	41	44	42	5	2	0	7	49	56
11 to 13	27	18.5	48	3.5	14.5	3.5	11	69	80
14 to 16	13	54	31	0	7.5	0	7.5	38.5	46

* Age is taken to nearest birthday; thus the 5 to 7 year group includes cases from 4 years 7 months through 7 years 6 months, etc.

and may therefore be taken as representative of it. This table may also be taken as indicating a high degree of consistency for the figures on the entire group. Under none of the categories is there a difference between the "new" cases and the entire group of more than 1%.

Since the number of cases at any one age was too small for the percentage figures to be taken as significant, the age interval taken in Table V is three years. The predominance of sinistrals over dextrals is still found at every age level, reaching its highest point in the group whose individual ages fall between 10 years 7 months and 13 years 6 months. The oldest group shows the lowest proportion of sinistrality. It is possible that this is the result of there being a much smaller number of cases in this group than in any other; a shift of one or two out of 13 cases would make considerable difference in the percentage distribution.

The reason for the extreme sinistrality of the 11-to-13 year group is not entirely clear. It is possible that the children referred within this age range present, as a group, more persistent and deep-seated personality difficulties than those referred at younger ages, among whom are a good many showing transitory problems of guidance and simple difficulties arising out of the school or home situation, less indicative of serious adjustment problems within the individual child. Experience suggests that this is probably the case, although it is impossible to demonstrate it satisfactorily in concrete terms of comparison of the relative "seriousness" of the personality complications in different cases. If it is true, the results are consistent with the other findings in which the more unstable groups show a higher proportion of sinistrality than the less unstable.

Examination of the types of problems shown by the various groups does not reveal a great deal of difference. The one exception to this fact seems to be in the matter of reading difficulty. The proportion of cases of children significantly retarded in reading for their age and intelligence is approximately the same for the RR and RL groups, but more than 80% of the LL, LR, RI, and LI cases who are far enough along in school to determine the point show retardation in this subject. In only a few cases, however, was this the problem for which the child was referred. Not

all of these cases are characteristic of the so-called "specific reading disability" type, although many of them are. In other cases, general instability and the effect of other adjustment difficulties seem to be responsible for the backwardness in reading.

Among the 44 "new" cases of the RR group there are 3 cases of stuttering and one other case of defective speech. Five cases of speech defect, including 4 stutterers, are found among the 45 cases of the RL group. There are 2 stutterers out of 8 LR cases, and 1 case each of defective speech without stuttering in the LL and RI groups. The sinistrals and impartial-eyed are thus seen to show relatively a few more cases of speech difficulty than the dextrals, but the total number is hardly great enough for the slight difference to be taken as significant.

As for problems of other types, they seem to be distributed fairly similarly among dextrals and sinistrals. Problems of school and social adjustment, of school achievement, of delinquency, etc., are found among all the lateral types. The conclusion suggested is that the sinistrals and dextrals develop the same kinds of adjustment problems, but that sinistrals, especially the mixed and impartial-eyed, are, in general, rather more likely to develop them than complete dextrals.

While these results throw some light on the association between laterality and a tendency to develop problems of adjustment, they do not in themselves suggest the desirability of a special type of treatment for the sinistral cases. Decidedly, they do not justify any attempt, except in a few clearly-defined special instances, to convert sinistrals or partial sinistrals into complete dextrals. There exists no convincing evidence of any sort that eye dominance is a determinant of handedness or that it is an index of "native" handedness, and the presence, for example, of left ocular dominance in a right-handed individual does not, so far as anyone has shown, indicate that that individual "should have been" left-handed. If any conclusion may be drawn on this matter from the still inadequate evidence that is available, it is rather to the effect that these factors of handedness and eyedness are merely two outstanding and determinable factors in a highly complex constellation of traits having a constitutional basis.

Summary

1. Data as to handedness and eyedness were obtained on all cooperative cases of children above the age of 4½ years who were referred to the Yale Clinic of Child Development during an entire clinic year. A group of 160 cases, consisting of children referred because of individual adjustment problems, was compared with a control group of 73 cases referred for commitment to State care as dependent or neglected children.

2. Handedness was determined by writing and/or throwing. Eyedness was tested by use of the Miles V-Scope. A distribution of the data was made in terms of the types RR (complete dextral), RL, LL, LR, RI, and LI, in which the first letter indicates the preferred hand and the second the preferred eye. The RI and LI groups were "impartial-eyed," with incomplete eye dominance.

3. Pure dextrals (RR) constituted 67% of the control group and 39% of the Problem Group. The sinistral and partially sinistral types (RL, LL, LR, LI) totaled 54% in the Problem Group as against 31.5% in the control group. The distribution for the Problem Group corresponds very closely to that reported by Quinan for a group of adult patients diagnosed as constitutionally psychopathic inferior.

4. Of the problem cases 10% were impartial-eyed, as against 1.5% of the non-problem group.

5. At all age levels the sinistral and impartial-eyed types were relatively more frequent among the problem cases than among the controls. The highest proportion of such types was found in the age group from 11 to 14 years. It is suggested that children referred at these ages may show more persistent and deep-seated personality complications than those referred younger.

6. No outstanding difference was found in types of problem encountered among the various types, with the exception that the left-handed and the impartial-eyed cases showed relatively more cases of children retarded in reading. There were, relatively, slightly fewer speech problems among the dextrals than among other types, but the total number was small, and the difference slight.

7. The results suggest that, in general, dextrals and sinistrals

develop the same sort of problems, but that sinistrals, and especially the mixed and impartial-eyed types, are rather more likely to develop them than those who are completely dextral.

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